

STAR-LITE 2007: NOAA Ship *David Starr Jordan*
Weekly Science Report

Tim Gerrodette, Cruise Leader
09 September 2007

Science Summary: <02-08 September 2007>

At the beginning of this week, we were still being tossed around at the edge of hurricane Henriette. After the storm passed Manzanillo, we headed to that city to drop off Liz Zele, who unfortunately had a family emergency. We will miss her on the ship, but we send her our best wishes. Thanks to the coordinated work of cruise maestro Annette, agent Vasile and the officers of the ship, Liz was processed through Mexican customs and immigration quickly, and by early Tuesday morning the *McArthur II* was already sailing back to the study area. We returned to much calmer seas than we had left two days earlier. The effect of lighter wind and smaller swell on our visual search for cetaceans is dramatic. Last week we had 16 cetacean sightings. This week, despite no transect effort on Sep 3-4 during the transit to and from Manzanillo, we had 113 sightings. During the last 4 days, we completed two pairs of passing/closing transects in good conditions, including all of the associated oceanographic, acoustic, and ecosystem sampling that we use to try to understand what is going on. Finally, it feels like we have settled into a routine (on a ship, that's a good thing).



Group of striped dolphins (*Stenella coeruleoalba*) encountered on STAR-LITE 2007 (photo: Adam Ü).

Going over the same stretch of ocean on successive days, one is struck with how different an area can be from one day to the next. We may see a different mix of birds and cetaceans, or we may see the usual actors but in greater or lesser abundance. What could account for this variability over such a short period of time? Providing answers to this question, or at least gaining some insights, is one of the main objectives of the cruise. Perhaps large, mobile animals like dolphins and seabirds are just moving around. Or perhaps they are responding to patches of food. Our net tows and echosounder backscatter data will shed light on this. Further clues come from sampling the ocean, both horizontally and vertically, with a

grid of XBT and CTD stations. Although we have purposely selected an area that is fairly uniform (that is, it does not have dynamic fronts where different water masses meet), nevertheless there may be small spatial or temporal differences that animals respond to. The “Yo-Yo” sampling described below is looking for another culprit: internal waves. These slow-moving waves under the ocean surface between water masses of different densities may concentrate patches of food for fish, dolphins and seabirds.

Besides the “Yo-Yo” CTD marathon, other noteworthy events this week were the all-night sampling for flying fish and the deployment of 2 ARGO buoys. Both are described in more detail below.

Sightings and Effort Summary for Marine Mammals (Jim Cotton, Richard Rowlett, Juan Carlos Salinas, Suzanne Yin, Ernesto Vázquez, Adam Ü)

Date	Start/ Stop Time	Position	Total nm	Average Beaufort	Mode
090207	0822	N13:34.21W106:14.78	82.8	6.0	closing
	1802	N14:49.13W105:22.40			
090307		in transit	N/A		
090407		in transit	N/A		
090507	0908	N16:06.53W106:15.18	97.5	2.5	passing
	1900	N14:44.58W105:20.32			
090607	0810	N16:05.70W106:14.75	68.9	2.7	closing
	1940	N14:32.95W105:24.79			
090707	1020	N13:43.70W103:39.22	66.4	3.2	passing
	1853	N12:27.83W104:26.65			
090807	0917	N13:44.00W103:39.01	61.5	2.1	closing
	1935	N12:24.40W104:21.74			

Code	Species	Number of Sightings
001	Mesoplodon peruvianus	1
002	Stenella attenuata (offshore)	38
010	Stenella longirostris orientalis	9
013	Stenella coeruleoalba	6
015	Steno bredanensis	5
018	Tursiops truncatus	1
048	Kogia sima	2
051	Mesoplodon sp.	1
061	Ziphius cavirostris	3
078	Unid. small whale	2
177	Unid. small delphinid	42
277	Unid. medium delphinid	3
Total		113

Photography (Adam Ü) and Biopsy (Juan Carlos Salinas, Ernesto Vázquez, Suzanne Yin)

The combination of some uncooperative weather, spending half of our on-effort days on passing mode, and evasive animals in a fishing area has made cetacean photography and biopsy more challenging than usual. We have a grand total of two biopsies of spotted dolphins. Last week we photographed two groups of offshore spotted dolphins coming over and riding the bow. We were able to get both “normal” photographs and “laser dot” photographs from both schools. This week we were able to get a couple more spotter schools on the bow for laser dot/size estimation photos as well as adding eastern spinner dolphins and striped dolphins to the general photo database.

The following tables include two weeks of photographic and biopsy efforts:

Code	Common Name	Weekly		Totals	
		Sightings	Photographs	Sightings	Photographs
002	<i>Stenella attenuata</i> (offshore)	5	166	5	166
010	<i>Stenella longirostris orientalis</i>	1	15	1	15
013	<i>Stenella coeruleoalba</i>	2	20	2	20
Total		8	201	8	201

Species	Common Name	Weekly		Total	
		Samples	Takes	Samples	Takes
Stenella attenuata	Pantropical Spotted Dolphin	2	2	2	2
Total		2	2	2	2

Squeakly Report (Shannon Rankin, Jay Barlow)

This week began with the unfortunate departure of one of our acousticians, Liz Zele. This is a tremendous loss, and we are very sad to see her go. After dropping her off at Manzanillo, we managed two days of acoustic effort on passing mode days, with 49 acoustic detections of dolphin schools, 21 of which were matched to visual sightings.

Bird Buzz (Michael Force and Sophie Webb)

This week's highlight for the bird team has to be the arrival of a fully functioning, bug-free SeeBird data acquisition program. We thought we had it beat last week, but the mysteries of computer code surfaced again. Instead of waving the white flag we called for help. Thanks to our code-crunching guru back at the lab, Robert Holland, for sorting out these gremlins. As for seabirds, it was pretty well business as usual. Thousands of Juan Fernandez Petrels and dark morph Wedge-tailed Shearwaters were the norm, at times overwhelming our data collection efforts. One impressive feeding flock spread out over more than 10 nautical miles, associating with an equally dispersed group of spotted and spinner dolphins and large yellowfin tuna, contained roughly 2000 Juans and 1200 Wedgies (birder-speak for Wedge-tailed Shearwater). Birds were everywhere one looked, stretching to the horizon. Determining the boundaries of this flock was an exercise in futility that leads us to ponder what exactly constitutes a feeding flock. Overall diversity was up this week, thanks to the arrival of lost boreal migrants such as Bank Swallow, Orange-crowned Warbler and Northern Waterthrush. In total, we found 24 species, up seven from the previous week. Our daily average, taking into account the two days lost in transit, remains comparable at nine.

Dipnetting (Eric Lewallen, Jim Cotton, Juan Carlos Salinas, Ernesto Vázquez, Adam Ü, Ryan Driscoll, Candy Hall)

Dipnetting this week was particularly successful due to stable weather, dark nights and favorable ship positioning. Since 02 September, we have collected 75 flyingfish (*Exocoetus*, *Hirundichthys*, *Cheilopogon*, *Cypselurus* and *Prognichthys*), 18 halfbeaks (*Oxyporhamphus micropterus*), 4 lanternfishes (Myctophidae), 1 snake mackerel (*Gempylus serpens*), 3 pelagic crabs (one with barnacles *Lepas* sp.) and 2 porcupinefish (Tetraodontiformes: Diodontidae). Purple-backed squids (*Sthenoteuthis* sp.) of various sizes have been present at all dipnetting stations. Several large predatory fishes were observed to aggregate near lighted dipnetting areas on several occasions. Bullet tunas (*Auxis rochei eudorax*), dolphinfish (Coryphaenidae) and juvenile billfish (Perciformes: Istiophoridae) clearly prey on organisms attracted to deck lights.

During the night of 08 September, an extended dipnetting effort was conducted in order to assess what flyingfish eat and whether different species feed at different times. This was made possible by the fact that the *McArthur* remained stationary throughout the night during CTD “yo-yo” operations. Preliminary stomach content analyses yielded at least three different gastropod taxa (Limacinidae, Cavoliniidae, Atlantidae) and one amphipod in an adult four-wing flyingfish (*Cheilopogon*) caught one hour after sunset. In total, 21 stomachs were preserved from fish over 10 cm (*Exocoetus*, *Oxyporhamphus*, *Cheilopogon*, *Prognichthys*) caught between the hours of 2105 and 0730. All stomach contents have been preserved in a mixture of buffered formalin for future sorting and identification. In addition to catching flyingfish steadily throughout the night, several non-target species were also collected. Of note during this extended station was the abundance of porcupinefish (Tetraodontiformes: Diodontidae, 20-30 sighted). Squids and snake mackerel were observed in moderate abundance and collected when possible. One Wedge-tailed Shearwater was also captured by dipnet (and later released), in order to protect it from flying into deck lights. Analysis of stomach contents will help us understand the diet and feeding habits of various flyingfish species.

Oceanography (Candice Hall, Ryan Driscoll, Eric Lewallen)

Life on the ocean has certainly been exciting for us over the past week as we have embarked on sampling methods that differ from our normal protocol. The first of these, and one of my personal favorites, was the deployment of Argo floats on Sunday and Friday. From the Argo Deployment Manual: “Argo is an international programme using autonomous floats to collect temperature, salinity and current data in ice-free oceans. It is teamed with the Jason ocean satellite series. Argo will soon reach its target of 3000 floats delivering data within 24 hours to researchers and operational centres worldwide.” Of relevance in the Pacific, data from the Argo programme have shown that “changes in the deep density structure of the subtropical South Pacific have increased ocean circulation by over 20 % since the 1990s. Argo will allow future monitoring of similar changes throughout the oceans. 23 countries contribute floats to Argo and many others help with float deployment.” Systems of this nature provide end users with a real-time data tool, as float profile data is posted on the internet within 24 hours after transmission. Since their deployment, both STAR-LITE 2007 floats have profiled down to approximately 2000m, before returning to the sea surface to transmit their data by satellite to PMEL in Seattle. Dr Elizabeth Steffen has forwarded these small text files to us out here, allowing for the comparison of these Argo float data versus our own CTD casts of the same location.

Our second deviation from the norm was last night’s festivities of what we’ve dubbed a CTD ‘Yo-Yo.’ After standard evening operations of a 1000m CTD, dipnet station and both net tows, we conducted CTD

casts from the surface to 200m. Ten times consecutively. No bottles were fired, as water samples were not our objective. What we are looking for are internal waves, apparent in the vertical profile of the CTD cast. Two additional casts to 200 m were conducted after the ‘Yo-Yo’ casts, before the regular morning CTD cast to 1000 m. Therefore we now have 14 CTD profiles to 200 m in a twelve hour period. Hopefully some results of this ‘Yo-Yo’ evening will be available in our next weekly. Many, many thanks to all who accompanied and entertained us throughout the night, especially Eric with his dipnetting marathon; next leg we’ll have to twiddle our thumbs between casts instead!

Net tows have again provided remarkable glimpses into another realm, so foreign to us landlubbers. Late night microscopic inspections have revealed colonial pelagic barnacles, larval echinoderms, strange pelagic fish (barracudina, Paralepididae, and a lovely slimehead, Trachichthyidae), and many wondrous new kinds of our favorites too numerous to mention. After looking at the diverse phenotypes caught in our tows, we three are left in no confusion as to where sci-fi critter artists obtain their inspiration. Our unrealistic goal is to catch a juvenile hatchet fish before the end of this leg. We’ll keep you posted.

The following table includes the last two weeks of oceanographic operations:

Date	CTD	XBT	Surface chlorophylls	Bongo Tows	Manta Tows	Other
26-Aug	3	4	4	1	1	
27-Aug	2	4 ^a	3	1	1	Concurrent XBT/CTD
28-Aug	2	4	4	1	1	
29-Aug	2	4	4	1	1	
30-Aug	2	4	4	1	1	
31-Aug	1 ^b	4	4	0 ^b	0 ^b	
1-Sep	1 ^c	4	3	1	1	
2-Sep	2	4	4	1	1	Argo float deployed, S/N: 3408
3-Sep				In transit		
4-Sep				In transit		
5-Sep	1.5 ^d	5	5	1	1	
6-Sep	1 ^d	5	5	1	1	
7-Sep	2	5	5	1	1	Argo float deployed, S/N: 3090
8-Sep	5	4	4	1	1	CTD Yo-Yo casts
Total	24.5	46	49	11	11	

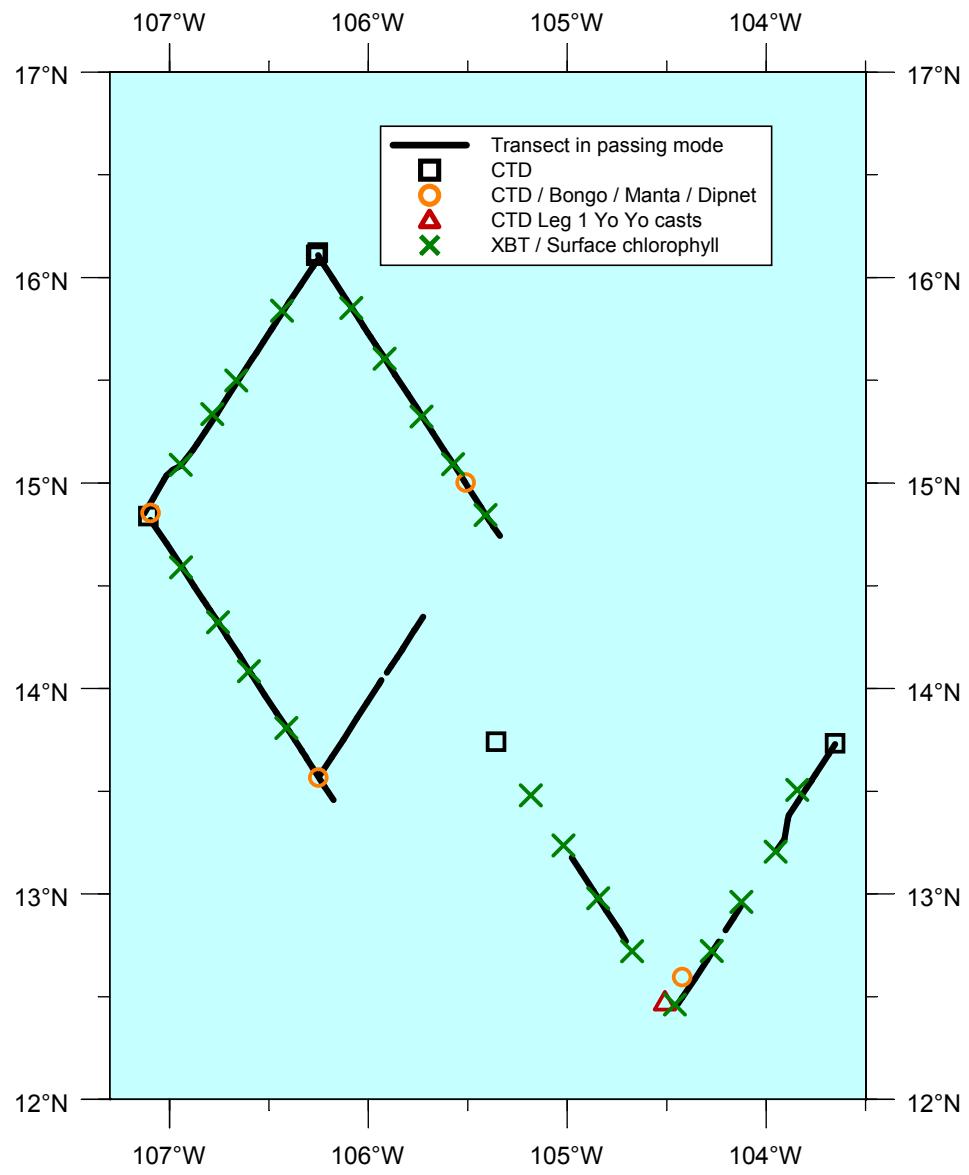
^aLast XBT drop concurrent with CTD location to compare profiles.

^bNo evening operations due to transit to a new location.

^cWeather prohibits evening CTD cast. XBT dropped instead.

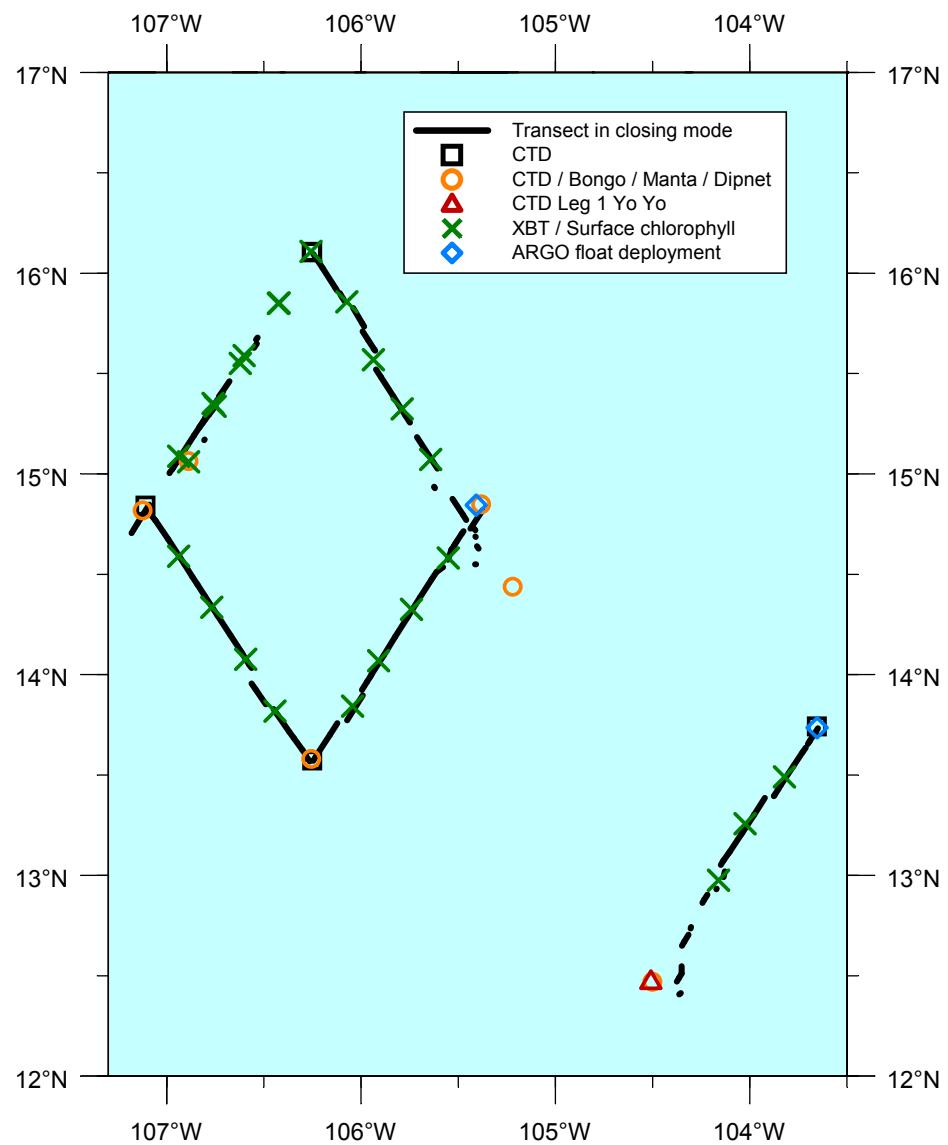
^dCTD deck unit blew a fuse on upcast, re-termination scheduled for Thurs am. Cast profile available.

SAMPLING EFFORT



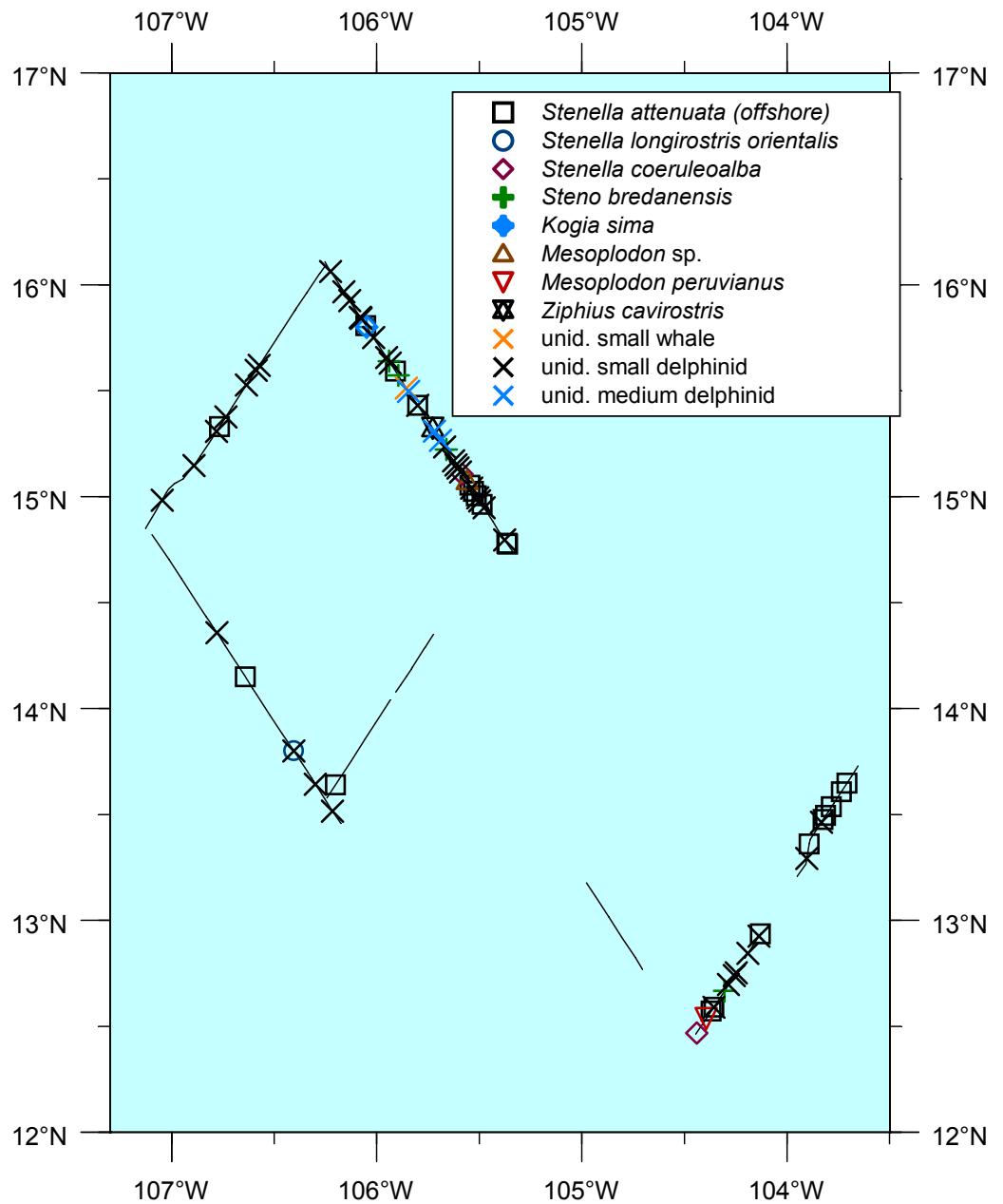
STAR-LITE sample effort on passing mode days.

SAMPLING EFFORT



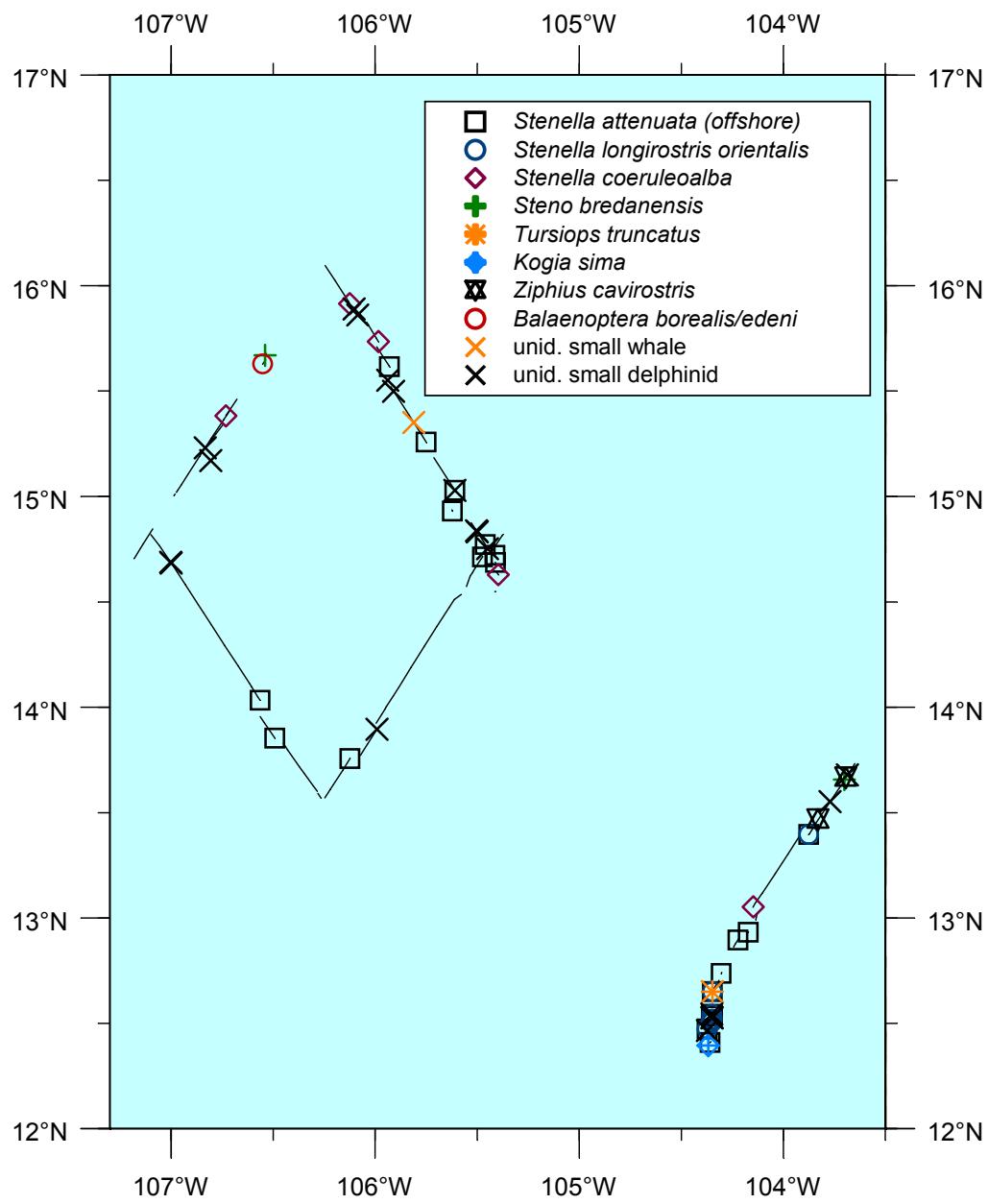
STAR-LITE sample effort on closing mode days.

CETACEAN SIGHTINGS



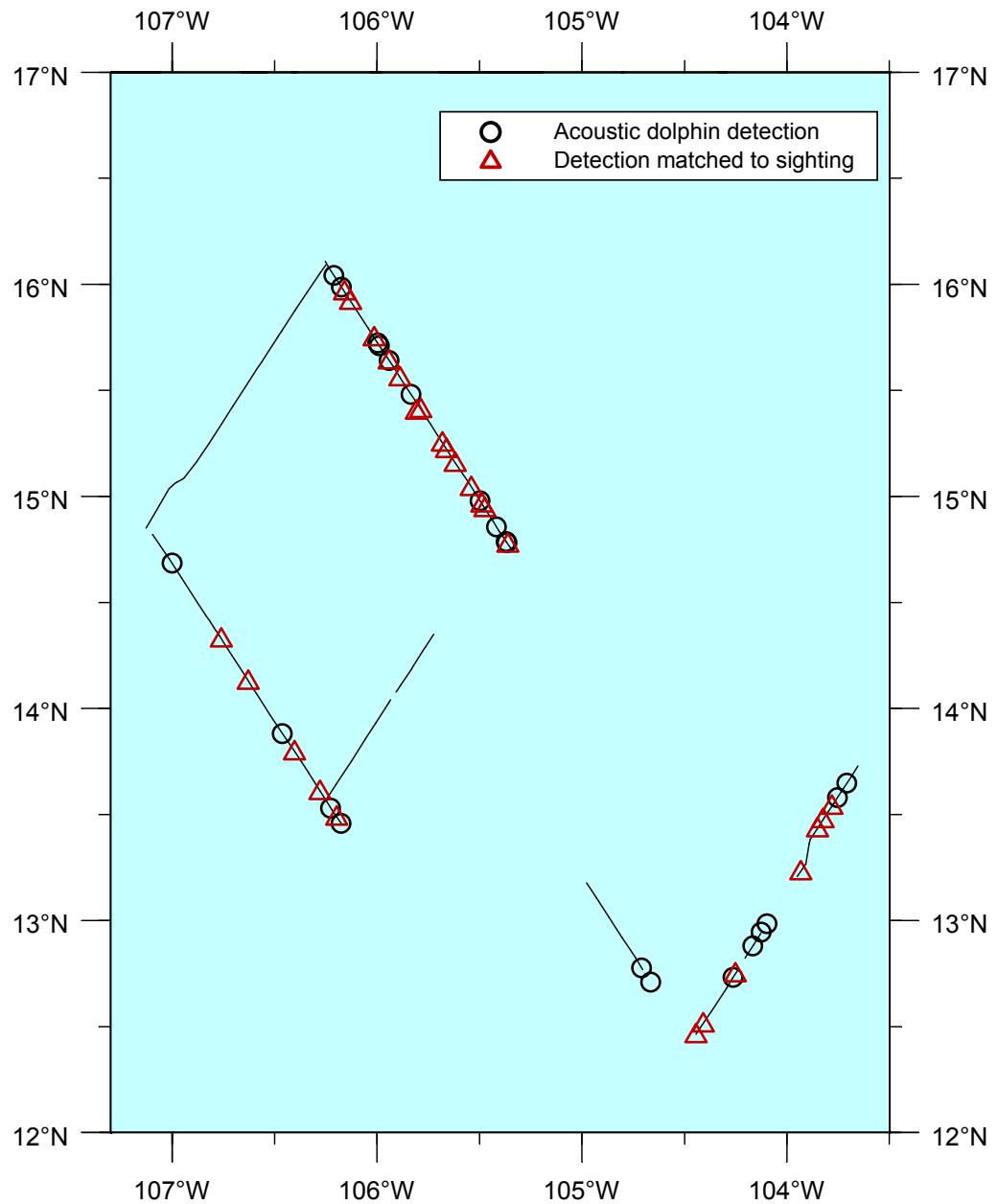
STAR-LITE cetacean sightings on passing mode days

CETACEAN SIGHTINGS



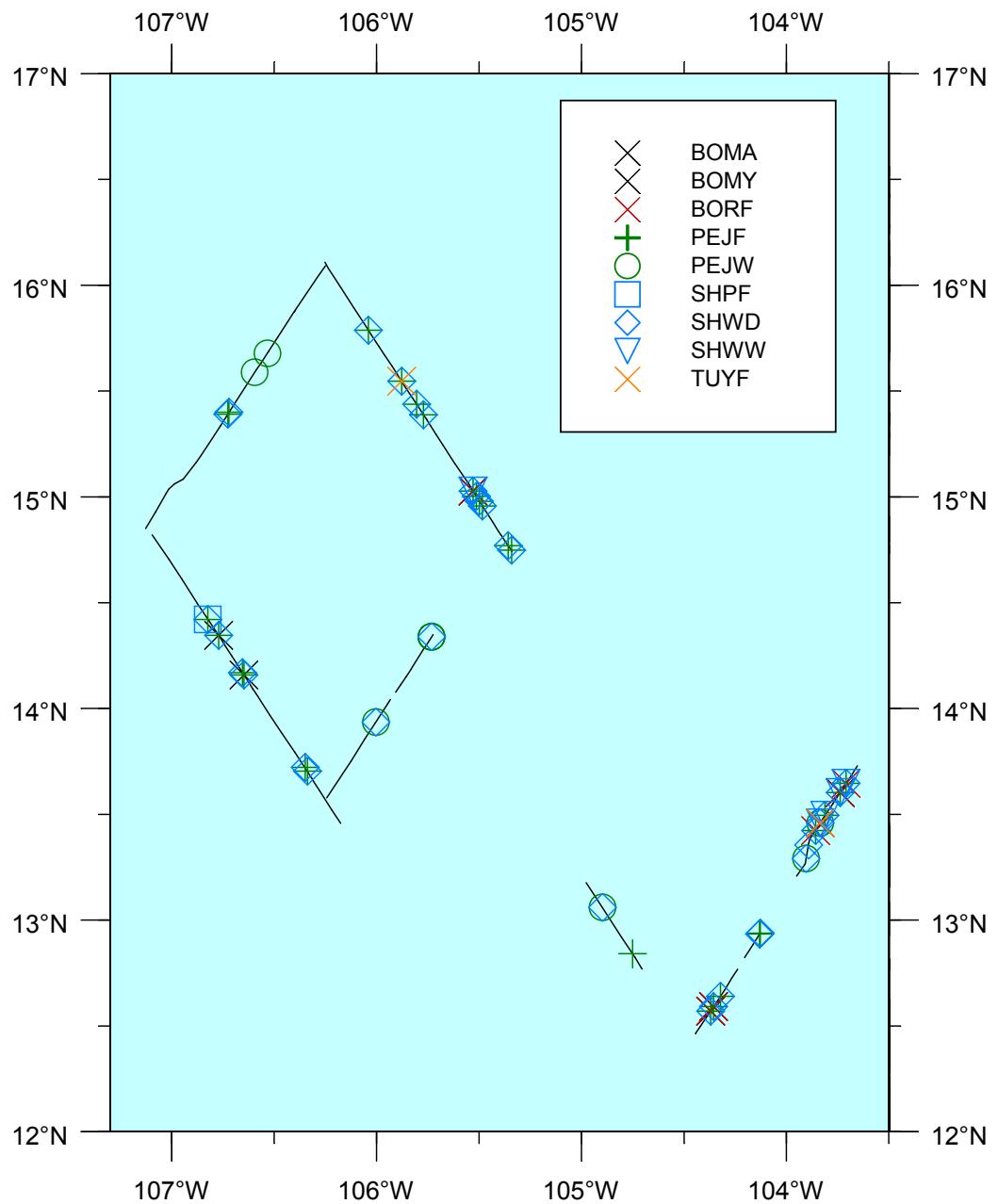
STAR-LITE cetacean sightings on closing mode days.

ACOUSTIC DETECTIONS



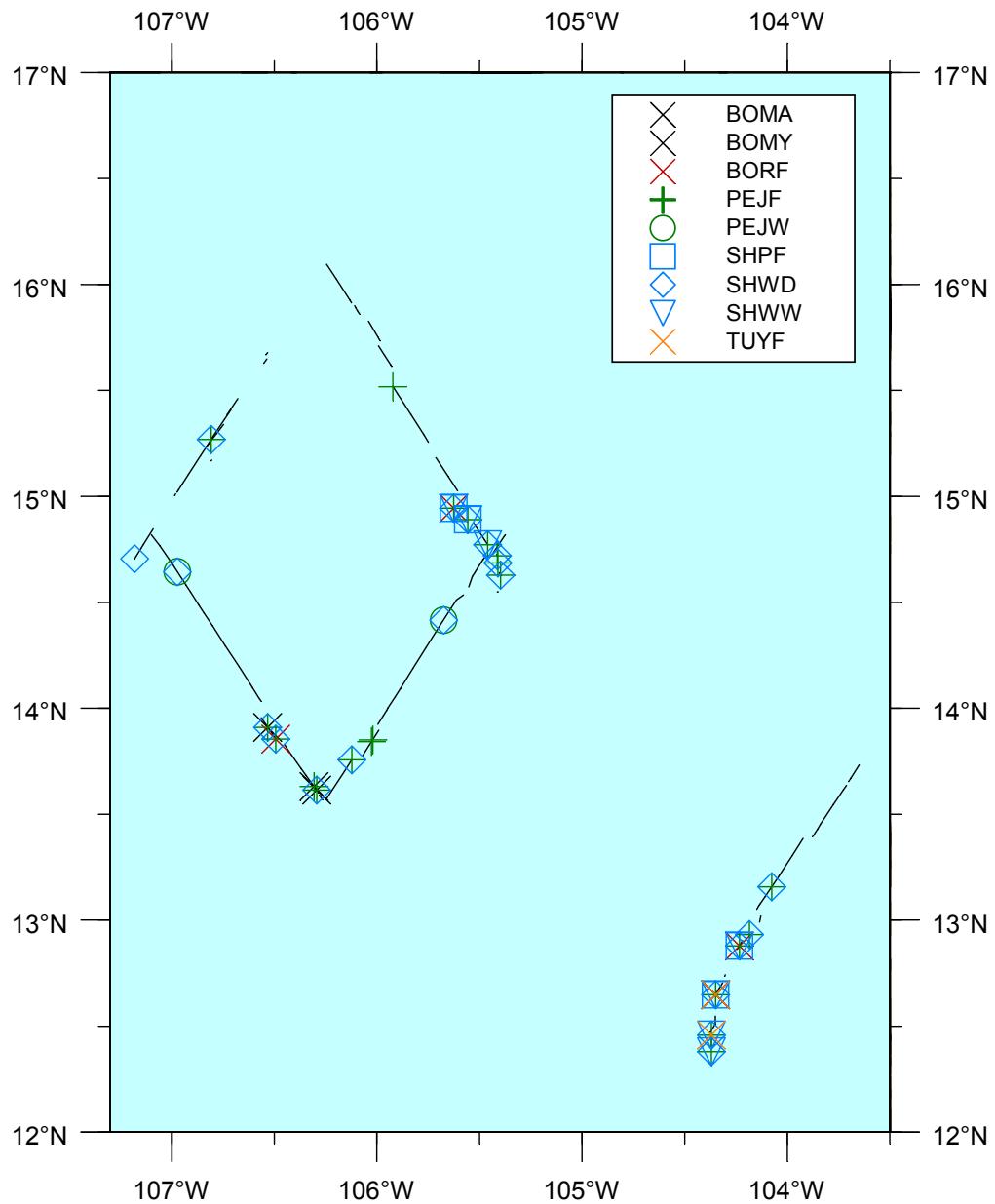
STAR-LITE acoustic detections on passing mode days.

SEABIRD FLOCK SIGHTINGS



STAR-LITE seabird flock sightings on passing mode days.

SEABIRD FLOCK SIGHTINGS



STAR-LITE seabird flock sightings on closing mode days.